REMARKS

Claims 1, 2, 4-8, 10-15, 17-29 and 66-92 are now presented for examination. Claims 1, 13, 15, 20, 66, 73, 80-82, 86-89, 91 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claim 92 has been added to assure Applicants of the full measure of protection to which they deem themselves entitled. Claims 1, 13, 20, 66, 73, 80, 86, 91 and 92 are the only independent claims.

Claims 1, 2, 4-8, 10-15, 17-29, 66-79 and 80-91 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite in that these claims fail to particularly point out and distinctly claim the subject matter of the Applicants' invention. With regard to the claims as currently amended, this rejection is respectfully traversed.

Independent Claims 1, 13 and 80 have been amended in consideration of the Examiner's comments to (1) change "a discharge electrode" to "discharge electrodes", (2) change the "output window" recitation to "an output half-mirror for reflecting the laser light and for outputting a portion of the laser light amplified between said total reflection mirror and said output half-mirror spaced for resonant reflection of the laser light", (3) change the circulating means or blower limitation to recite recirculating laser gas within a chamber through an electrical discharging region of discharging electrodes, (4) to change the operating means recitation to recite in Claims 1 and 80 "in one of a stand-by state and an in-operation state" and in Claim 13 to recite "said discharging electrodes being in one of a non-exposure stand-by state and an exposure operating state", the non-exposure stand-by state being one in which no laser gas is excited by the electrical discharging from said discharging electrodes, and the exposure operating state being

one in which the laser gas is excited by electrical discharging from said discharging electrodes, (5) to delete the objected-to "exposure device" in Claim 13, and (6) to change "circulation capacity" in Claim 80 to "circulation". Claim 20 has been amended to correspond to Claim 1.

Independent Claims 66 and 73 have been amended in consideration of the Examiner's comments to recite more clearly that the laser gas supplying means supplies a laser gas to an excitation region, excitation means excites supplied laser gas and the laser gas supply means is controlled on the basis of whether or not the laser gas is to be excited.

With regard to the objections to Claims 86 and 91 as dependent claims of independent Claim 80, each of Claims 86 and 91 has been rewritten in independent form taking into account the changes made to Claim 80.

Claims 66, 67 and 69 have been rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 4,611,327 (Clark et al.). With regard to the claims as currently amended, this rejection is respectfully traversed.

Independent Claim 66 as currently amended is directed to a gas laser device in which a laser gas supplying unit supplies a laser gas to an excitation region. An excitation unit excites the laser gas supplied to the excitation region and a control unit controls the laser gas supply unit on the basis of whether the laser gas is to be excited by the exciting unit or not.

In Applicants' view, Clark et al. discloses a gas transport laser system in which a pulse forming network location for minimizing electrical discharge loop inductance is provided. RFI shielding is included as a result of containment of the pulse forming network housed in a dielectric structure eccentrically mounted within a pressurizable vessel and forming a portion of a high-speed gas flow loop. The gas recirculating blower motor is mounted external to the

pressurizable vessel and does not add to the laser system dimensions. The blower is coupled to the blower motor by a magnetic coupling. Blower speed and power can be changed readily. Corona or cold-cathode X-ray preionization is provided in order to provide arc-free gas discharge. Materials compatible with the laser gases are used in construction.

According to the invention of Claim 66, control means control laser gas supplying means supplying laser gas to an excitation region on the basis of whether the laser gas supplied to the excitation region is to be excited by laser exciting means or not.

Clark et al. may teach a blower arrangement in a gas transport laser system using alternative blower rotation methods. In Clark et al., an alternative electrode configuration is disclosed in which a gas mixture passes through screen electrodes parallel to a discharge electric field. As noted at lines 39-49 of column 11 in Clark et al., "This alternative flow-through electrode configuration, then, provides a low inductance electrical discharge loop, eliminates the electrode boundary layer problem, and allows for a clearing ratio of only one, which overcome the factors that the gas flow pressure drop in the region of the electrodes 46 and 48 increases, the gas velocity decreases, and the load on the drive means 26 for the gas recirculating means 24 increases if the flow-through electrode configuration is incorporated." There is, however, no disclosure in Clark et al. of controlling the supply of laser gas for excitation in response to the excitation state of an excitation means (e.g., state of discharging electrodes). As a result, it is not seen that Clark et al. in any manner teaches or suggests of the feature of Claim 66 of controlling the supply of a laser gas to an excitation region on the basis of whether the gas is to be excited by excitation means or not. It is therefore believed that Claim 66 is completely distinguished from Clark et al. and is allowable.

Claims 1, 2, 4-8, 10-15, 17-29, 68, 70-79 and 80-90 have been rejected under 35 U.S.C. § 103 as being unpatentable over the Clark et al. patent as applied above when considered with U.S. Patent No. 5,770,933 (Larson et al.), U.S. Patent No. 5,946,138 (Mizouchi), and U.S. Patent No. 5,383,217 (Uemura). With regard to the claims as currently amended, this rejection is respectfully traversed.

Independent Claims 1 and 20 as currently amended are directed to a gas laser arrangement in which laser gas is confined in a chamber and the laser gas is excited through electrical discharge using discharging electrodes. The laser light produced by the electrical discharging from the discharging electrodes is totally reflected by a total reflection mirror and the laser light is reflected by an output half mirror and a portion of the laser light reflected between the total reflection mirror and the output half mirror spaced for resonant reflection is output. Rotation of the blower is operated responsive to the discharge electrodes being in one of a standby state and an in-operation state. The blower operates in the standby state in which no laser gas is excited by the electrical discharging from the discharging electrodes and in the in-operation state in which the laser gas is excited by the electrical discharging from the discharging electrodes to output the laser light.

Independent Claim 13 as currently amended is directed to exposure apparatus in which a laser light source has a chamber that confines a laser gas therein. Discharging electrodes excite the laser gas through electrical discharging. A total reflection mirror totally reflects laser light produced by the electrical discharging from the discharging electrodes and an output half mirror reflects the laser light and outputs a portion of the laser light reflected between the total reflection mirror and the output half mirror that are spaced for resonant reflection of the laser

light. A blower recirculates the laser gas within the chamber through an electrical discharging region of he discharging electrodes. A main assembly exposes a substrate to the laser light from the laser light source. An operating unit operates the blower in response to the discharging electrodes being in one of a non-exposure stand-by state and an exposure operating state. A first part of the operating unit operates the blower rotation in the non-exposure stand-by state in which no laser gas is excited by the electrical discharging of the discharging electrodes for outputting laser light. A second part of the operating unit operates the blower rotation in the exposure operating state in which the laser gas is excited by the electrical discharging from the discharging electrodes to output the laser light.

In Applicants' opinion, Larson et al. discloses a brushless DC blower motor with an adjustable timing feature. The timing adjustment allows a specific motor's performance to be optimized by compensating for individual variations both in the characteristics of the rotor position sensors as well as in their locations. The rotor position sensors may be affixed to a heat sink within a portion of the motor housing. To improve the cooling efficiency of the heat sink, at least a portion of the motor housing to which the heat sink is thermally coupled is cooled through either active or passive cooling. The rotor position sensors may be enclosed by a structure which improves their thermal and electrical isolation. A means of monitoring and controlling the speed of the motor is also provided.

Mizouchi, in Applicants' view, discloses an arrangement for aligning an analog laser transmitter in which operational characteristics of the laser are determined. These characteristics are used to derive the power level required of a communication signal to properly modulate the laser for communication across an optical fiber. The magnitude of an input

communication signal is then adjusted to the derived level, and maintained at this level for proper modulation. The alignment is performed upon the replacement of laser components in the field. The alignment may also be periodically effected to compensate for normal degradation of laser components over time.

Uemura, in Applicants' opinion, discloses an exposure apparatus such as a stepper that uses a laser light source requiring new gas introduction from time to time. The timing of new gas addition and partial gas replacement is controlled so that the exposure apparatus is not adversely affected. The timing may be such that gas introduction or replacement occurs during interruption of exposure operation, which does not start again until the fluctuation of the output of laser light caused by gas introduction or replacement is stabilized.

In accordance with the invention of Claims 1, 13 and 20, operating means operate blower rotation in response to discharging electrodes being in a stand-by state or in an in-operation or exposure operating state. Advantageously, the control based on the state discharging electrodes for laser gas substantially extends the life of the blower.

As discussed with respect to Claim 66, Clark et al. only teaches a blower arrangement in a gas transport laser system in which the blower rotation method may be changed. Clark et al., however, fails to suggest operating blower rotation in rcsponse to laser gas discharge electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes. Accordingly, it is not seen that Clark et al. in any manner suggests the features of Claims 1, 13 and 20.

Larson et al. may disclose a blower speed control arrangement (lines 17-46 of column 7) in which a controller 1101 monitors the speed of a fan by monitoring the speed of either of two motors 1001 and 1005. If the speed of the fan is incorrect, controller 1011 sends out a single drive current command, either to increase or decrease the drive current of the motors. In one alternative, a blower fan protection circuit 1101 prevents the motors from being damaged by operating at too high of a speed. The protection circuit 1101 continually compares the fan speed with a preset maximum limit. If the fan speed exceeds the preset limit, a disable signal is sent to the motor drive circuits which prevents further operation of the motors until the disable signal is removed. In the preferred embodiment, the disable signal is sent for a predetermined period of time, after which the operation of the motors can be reinitiated. There is, however, no suggestion in Larson et al. of the feature of Claims 1, 13 and 20 of operating blower rotation in response to laser gas discharging electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes. With regard to the combination of Clark et al. and Larson et al., it is not seen that the addition of Larson et al.'s control by monitoring fan speed and changing the speed if it is determined to be incorrect and comparing the fan speed with a preset maximum limit to Clark et al.'s changing blower rotation methods devoid of operating blower rotation in response to laser gas discharge electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes in any manner suggests the features of Claims 1, 13 and 20.

Mizouchi has been cited as disclosing exposure apparatus for exposing a substrate to laser light supplied from a gas laser and Uemura has been cited as disclosing exposure apparatus using an excimer laser requiring a mixed gas that causes a discharge in a chamber to emit laser light. Neither Mizouchi nor Uemura relate in any way to the feature of Claims 1, 13 and 20 of operating blower rotation in response to laser gas discharge electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes. As a result, it is not seen that the addition of Mizouchi's substrate exposure to laser light supplied by a gas laser, Uemura's the gas mixture for electrical discharge to emit laser gas, and Larson et al.'s fan speed monitoring control to change incorrect speed and comparison with a preset maximum limit to Clark et al.'s alternative blower rotation methods without reference to operation states of an excitation means could possibly suggest the feature of Claims 1, 13 and 20 of operating blower rotation in response to laser gas discharge electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes. It is therefore believed that Claims 1, 13 and 20 as currently amended are completely distinguished from any combination of Clark et al., Larson et al., Mizouchi and Uemura and are allowable.

Independent Claim 73 as currently amended is directed to exposure apparatus that has a gas laser device. In the gas laser device, a laser gas supplying unit supplies a laser gas to an excitation region and an exciting unit excites the laser gas supplied to the exciting unit. A control unit controls the laser gas supplying unit on the basis of whether the laser gas is to be excited by the exciting unit or not.

Newly added independent Claim 92 is directed to a semiconductor manufacturing method in which a predetermined pattern is transferred onto a substrate using an exposure apparatus and a semiconductor device is manufactured from the patterned substrate. The exposure apparatus has a gas laser device. In the gas laser device, a laser gas supplying unit supplies laser gas to an excitation region. An excitation unit excites the laser gas supplied to the exciting region. A control unit controls the laser gas supplying unit on the basis of whether the laser gas is to be excited by the exciting unit or not.

It is a feature of Claim 73 as currently amended and newly added Claim 92 that a gas laser supplying means is controlled on the basis of whether the laser gas is to be excited or not. As discussed with respect to Claim 66, Clark et al. only teaches a blower arrangement in a gas transport laser system using alternative blower rotation methods wherein a gas mixture passes through screen electrodes parallel to a discharge electric field which overcome the factors that the gas flow pressure drop in the region of electrodes increases, the gas velocity decreases, and the load on the drive means 26 for the gas recirculating means 24 increases if the flow-through electrode configuration is incorporated. Clark et al., however, is devoid of any suggestion of controlling the supply of laser gas on the basis of whether the laser gas is to be excited by the exciting unit or not. As a result, it is not seen that Clark et al. in any manner teaches or suggests of the feature of Claims 73 and 92.

Larson et al. is restricted to disclosing a blower speed control arrangement in which a controller monitors the speed of a fan by monitoring the speed of either of two motors and controlling to increase or decrease the drive current of the motors if the speed is determined to be incorrect and in which a blower fan protection circuit prevents the motors

from being damaged by operating at too high of a speed by comparing the fan speed a preset maximum limit. There is, however, no suggestion in Larson et al. of the feature of controlling the supply of laser gas on the basis of whether the laser gas is to be excited by the exciting unit or not. Mizouchi is directed substrate exposure to laser light supplied by a gas laser and Uemura is directed to gas mixture for electrical discharge to emit laser gas. Neither Mizouchi nor Uemura in any manner relates to the control of a gas supplying on the basis of whether or not a gas laser is to be excited by an exciting unit as in Claims 73 and 92. Accordingly, none of cited references suggests the features of Claims 73 and 92 and it is not seen that the cited combination of Clark et al., Larson et al., Mizouchi and Uemura could possibly suggest these features. It is therefore believed Claims 73 and 92 as currently amended are completely distinguished from any combination of Clark et al., Larson et al., Mizouchi and Uemura and are allowable.

Claims 80, 86 and 91 are directed to a gas laser device, an exposure device or a semiconductor manufacturing method in which a chamber confines a laser gas and discharging electrodes excite the laser gas through electrical discharge. A total reflection mirror amplifies laser light produced by the electrical discharging. An output half-mirror amplifies the laser light and outputs a portion of the laser light amplified between the total reflection mirror and the output half-mirror that are spaced for resonant reflection of the laser light. A recirculating unit recirculates the laser gas within the chamber through an electrical discharging region of the discharging electrodes. A control unit controls the recirculation unit in response to the discharging electrodes being in a stand-by state or an in-operation or exposure operation state to provide first gas circulation in the stand-by state in which no laser

gas is excited by the electrical discharging and second gas circulation in the in-operation of exposure operation state in which the laser gas is excited by the electrical discharging to output the laser light.

It is a feature of Claims 80, 86 and 91 that recirculating means are responsive to the discharging electrodes being in one of a stand-by state and an in-operation or exposure operation state to provide first gas circulation in the stand-by state in which no laser gas is excited and second circulation in the in-operation or exposure operation state in which laser gas is excited. As discussed with respect to Claims 1, 13 and 20, Clark et al. is restricted to teaching a blower arrangement in a gas transport laser system in which the blower rotation method may be changed but fails to suggest operating blower rotation in response to laser gas discharge electrodes being in one of stand-by state in which no laser gas is excited by discharging electrodes and in-operation or exposure operation states in which the laser gas is excited by the discharging electrodes. Larson et al. only teaches a blower speed control arrangement which monitors the speed of either of two motors for speed correction and a protection that continually compares fan speed with a preset maximum. Neither Mizouchi's substrate exposure to laser light supplied by a gas laser nor Uemura's the gas mixture for electrical discharge to emit laser gas relates in any manner to the recirculating means operating in a stand-by state or in one of an in-operation state or exposure operation state. Since none of the cited references in any manner suggests the features of Claims 80, 86 and 91, it is believed that these claims are completely distinguished from any combination of Clark et al., Larson et al., Mizouchi and Uemura and are allowable.

A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration or reconsideration, as the case may be, of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable consideration and reconsideration and early passage to issue of the present application.

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